WHAT IS CLAIMED IS:

1. A MEMS variable optical attenuator for attenuating the amount of light to a designated value by means of an electrical control signal, comprising:

a substrate with a flat upper surface;

an optical transmitting terminal and an optical receiving terminal, arranged on the upper surface of the substrate so that their optical axes coincide with each other;

a movable electrode arranged on the substrate and provided with a first comb portion moving in a vertical direction of the optical axes;

fixed electrodes fixed to the substrate and provided with a second comb portion interdigitated with the first comb portion; and

an optical cut-off film electrically connected to the first comb portion and being movable to a designated attenuation position between the optical transmitting and receiving terminals according to the movement of the first comb portion,

wherein a dielectric material film with permittivity of more than 3 is formed on facing side surfaces of teeth of at least one of the first and second comb portions.

2. The MEMS variable optical attenuator as set forth in claim 1,

wherein the dielectric material film is formed on facing

side surfaces of teeth of both of the first and second comb portions.

3. The MEMS variable optical attenuator as set forth in claim 1,

wherein the dielectric material film is made of a material, having step coverage of more than approximately 60%, deposited on the side surfaces.

4. The MEMS variable optical attenuator as set forth in claim 1,

wherein the dielectric material film is made of a material selected from the group consisting of SiO_2, Si_3N_4, Ta_2O_5, TiO_2, and TaON.

5. The MEMS variable optical attenuator as set forth in claim 1,

wherein the dielectric material film has a thickness sufficient to insulate a voltage corresponding to the electrical control signal.

6. The MEMS variable optical attenuator as set forth in claim 5,

wherein the dielectric material film is a Ta_2O_5 film with a thickness of at least approximately 10nm.

7. The MEMS variable optical attenuator as set forth in

claim 1,

wherein the dielectric material film is a Ta_2O_5 film with a thickness of at least approximately 10nm.

8. A method for manufacturing a MEMS variable optical attenuator comprising the steps of:

(a) preparing an SOI substrate including upper and lower silicon layers and an insulating layer interposed therebetween;

(b) forming a micro-structure by selectively etching the upper silicon layer, said micro-structure including a movable electrode provided with a first comb portion, an optical cut-off film electrically connected to the first comb portion, and fixed electrodes provided with a second comb portion interdigitated with the first comb portion;

(c) removing a lower surface of a portion of the micro-structure corresponding to at least the optical cut-off film and the first comb portion;

(d) coating a metal film on the surface of a portion of the micro-structure corresponding to at least the movable electrode and the fixed electrodes, thus forming the movable electrode and the fixed electrodes; and

(e) forming a dielectric material film on facing side surfaces of teeth of at least one of the first and second comb portions.

9. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein in the step (e) the dielectric material film is formed on facing side surfaces of teeth of both of the first and second comb portions.

10. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein the dielectric material film is made of a material with permittivity of more than 3.

11. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein the dielectric material film is made of a material, having step coverage of more than approximately 60%, deposited on the side surfaces.

12. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein the dielectric material film is made of a material selected from the group consisting of SiO_2, Si_3N_4, Ta_2O_5, TiO_2, and TaON.

13. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein the dielectric material film has a thickness sufficient to insulate a voltage corresponding to the electrical control signal.

14. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 13,

wherein the dielectric material film has a thickness of at least approximately 10nm.

15. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein the dielectric material film is made of Ta_2O_5 so as to have a thickness of at least approximately 10nm.

16. The method for manufacturing a MEMS variable optical attenuator as set forth in claim 8,

wherein the step (e) includes:

(e-1) forming the dielectric material film on upper and side surfaces of the micro-structure; and

(e-2) removing the dielectric material film from the upper surface of the micro-structure.

17. A micro-actuator comprising a movable electrode provided with a first comb portion and fixed electrodes provided with a second comb portion interdigitated with the first comb portion,

wherein a dielectric material film with permittivity of more than 3 is formed on facing side surfaces of teeth of at least one of the first and second comb portions.